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(12) UK Patent Application (19) GB (11) 2 321 700 (13) A

(43) Date of A Publication 05.08.1998

(21) Application No 9702246.1

(22) Date of Filing 04.02.1997

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(51) INT CL^6
F24C 7/00

(52) UK CL (Edition P)
F4W W57
G5C CDBF

(56) Documents Cited
GB 2267563 A **GB 1097812 A** **GB 0450941 A**
GB 0414280 A

(58) Field of Search
UK CL (Edition P) **F4W**
INT CL^6 **F24C 7/00**
ONLINE DATABASE:WPI

(54) Abstract Title
Flame effect fire

(57) A flame effect (light) generator (46), for a fuel effect fire (10), uses a rotary drum (33), with an optical sleeve (36) printed with a coloured flame effect image, which is back-projected, by an internal lamp (31), through a perforated mask (22), upon a matt surface of a diffuser screen (21). The drum (33) may be of heat-resistant, synthetic plastics material eg polycarbonate. The sleeve (36) may be of partially translucent thermoplastics sheet material, such as electrostatic copier or laser printer acetate film, printed with flame imagery. The sleeve (36) may also include a sporadic array of flame-shaped cut-out portions (37). The sleeve (36) may have a multiple filter array of stacked or inter-nested layers (48,49,51).

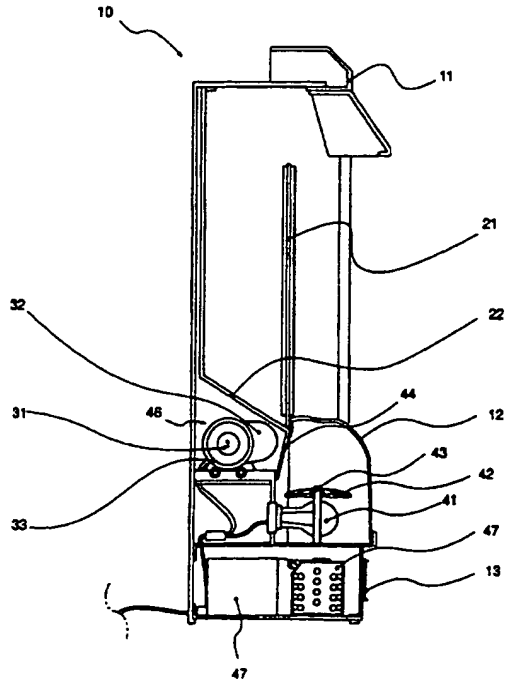

Figure 4

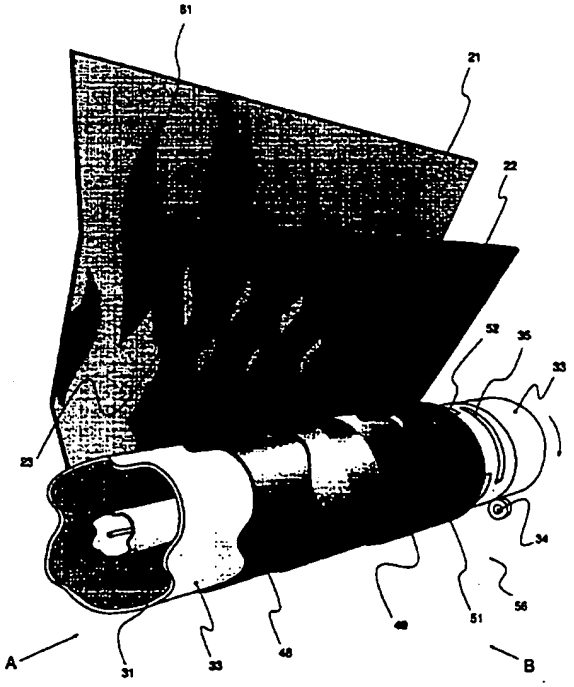

Figure 5

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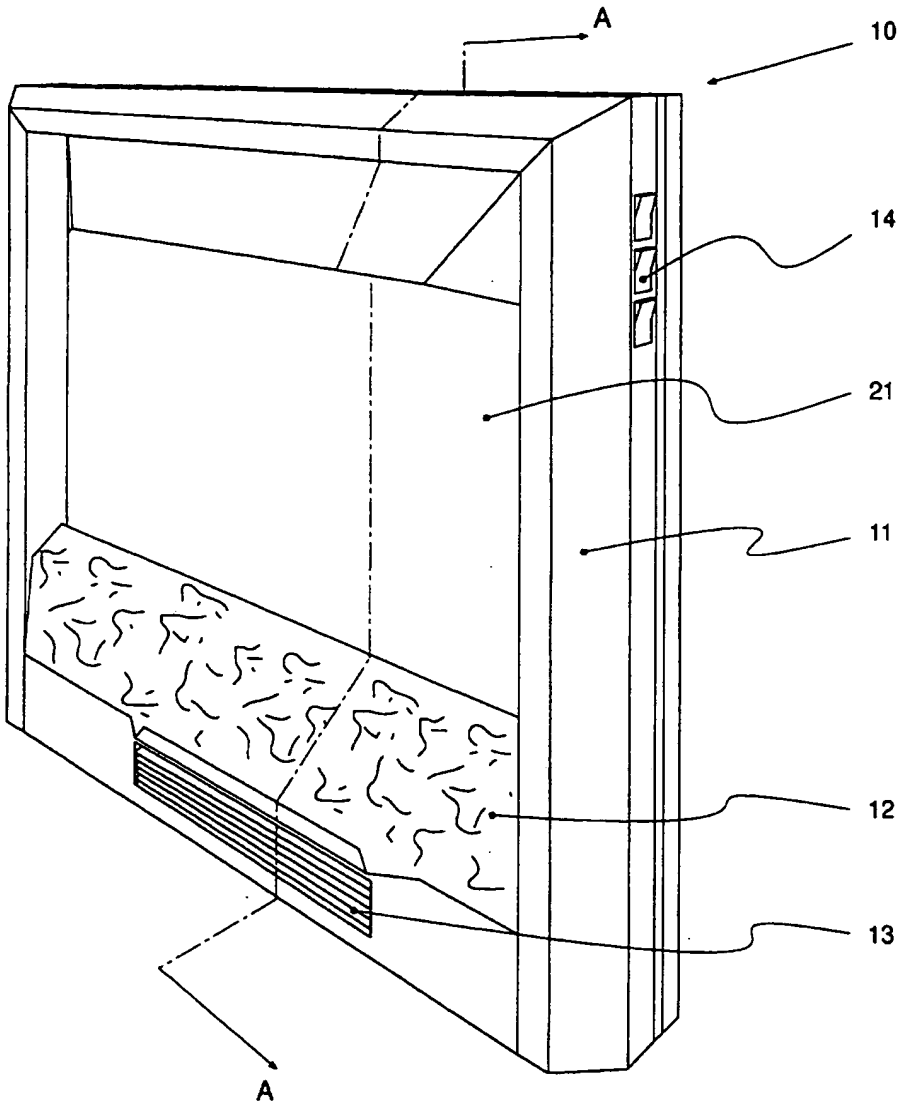


Figure 1

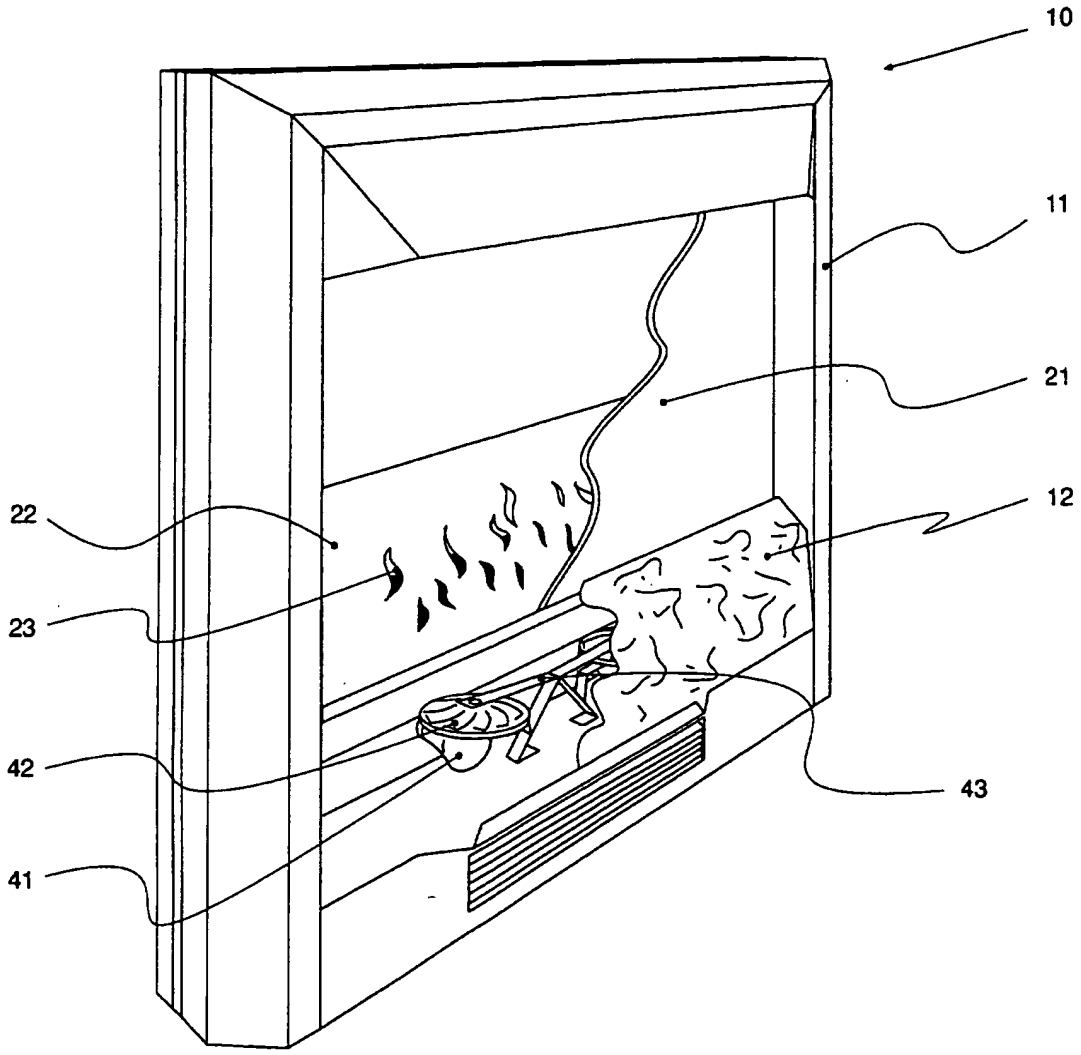


Figure 2

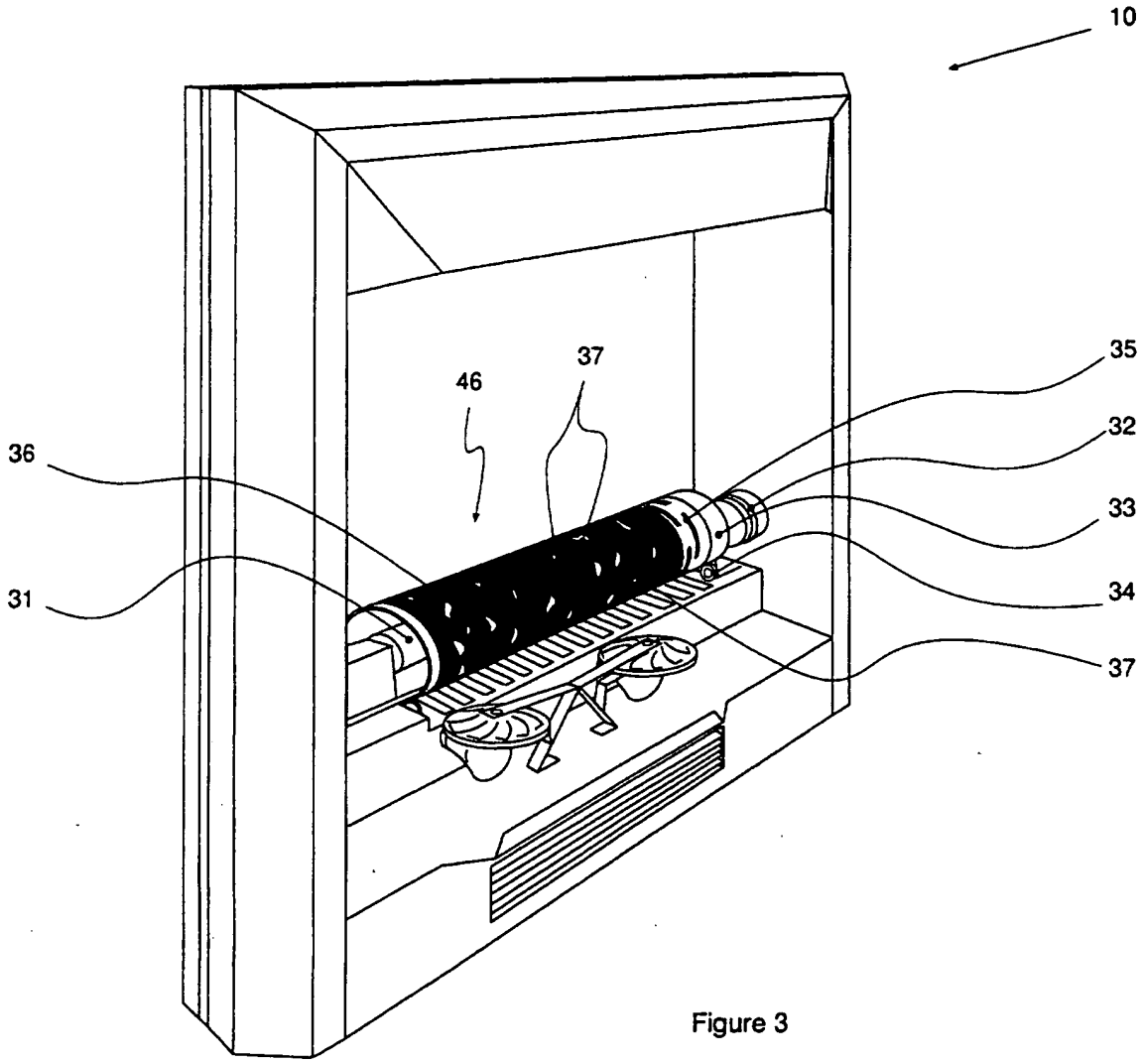


Figure 3

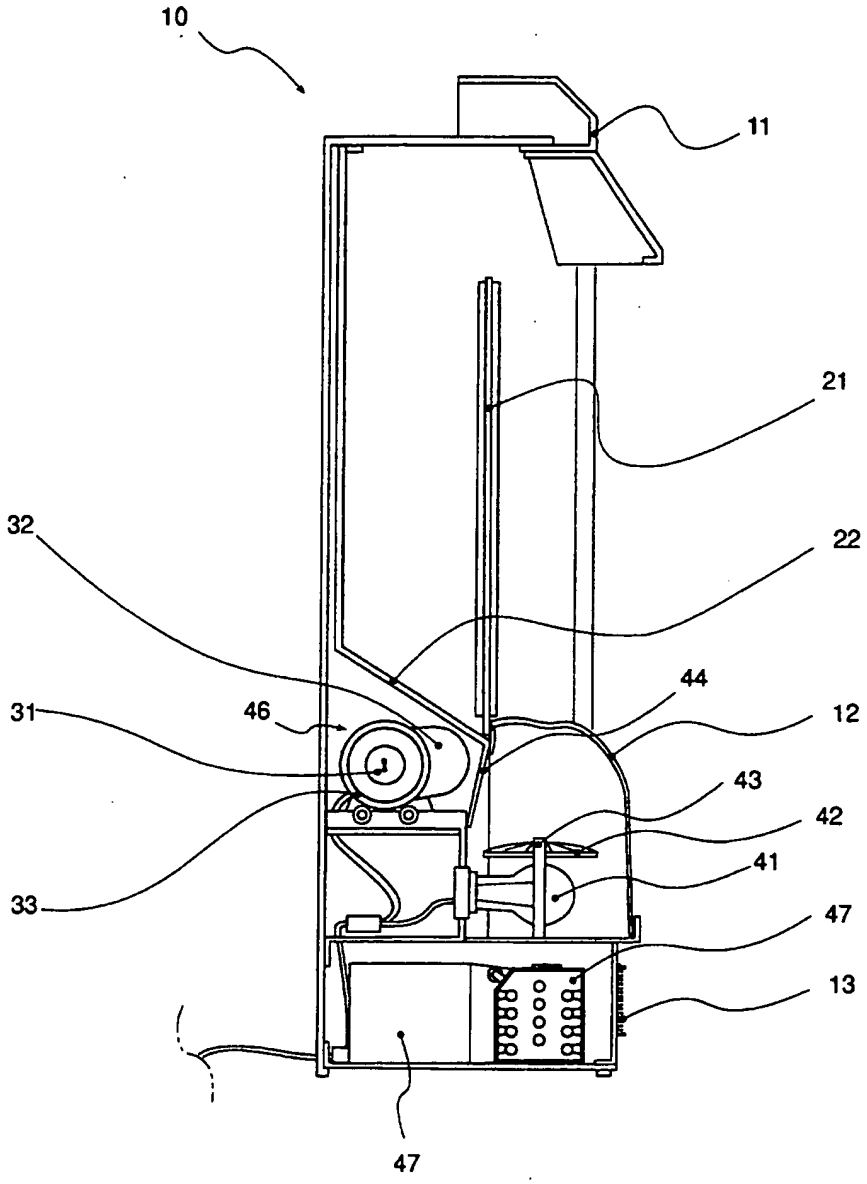


Figure 4

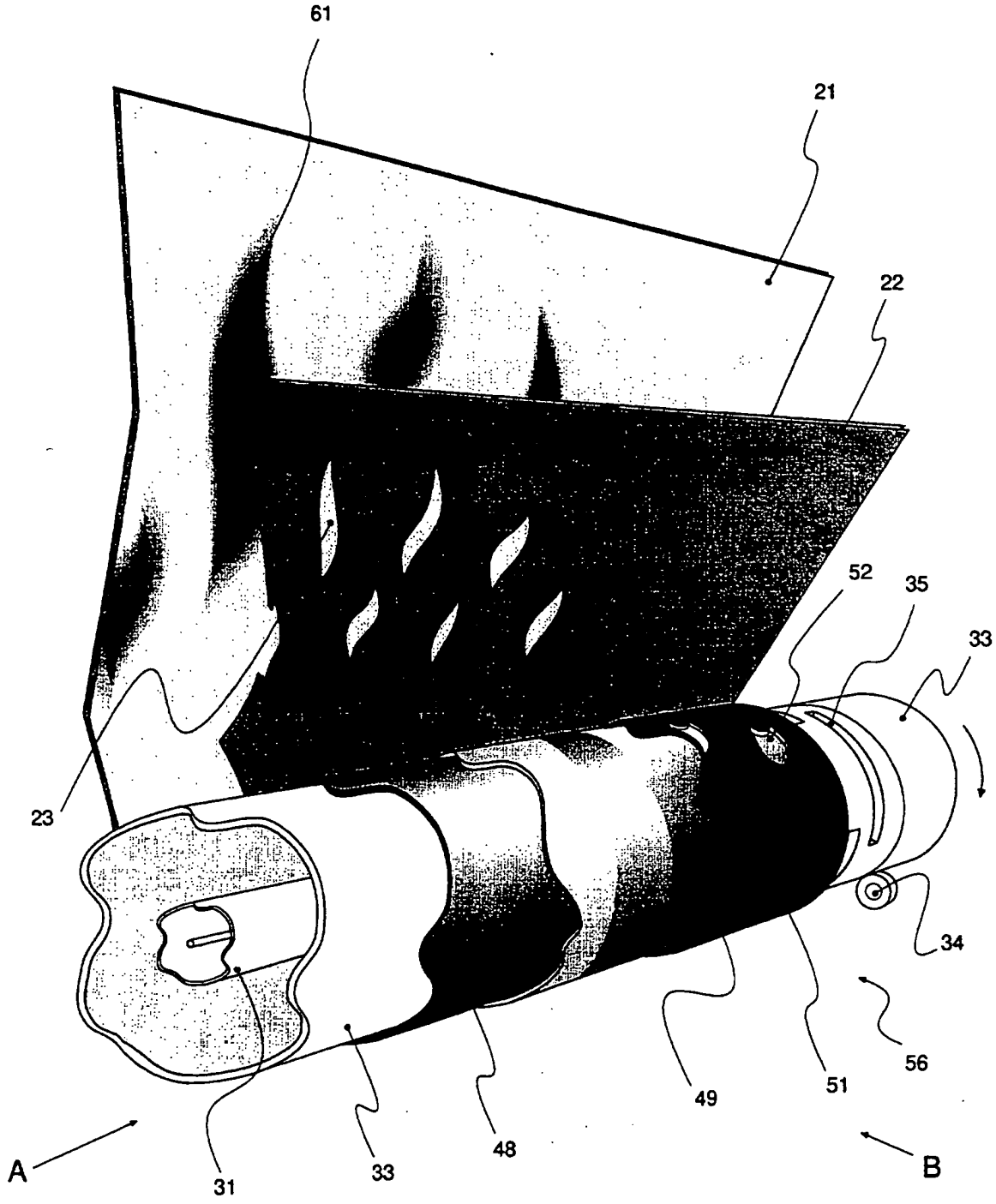


Figure 5

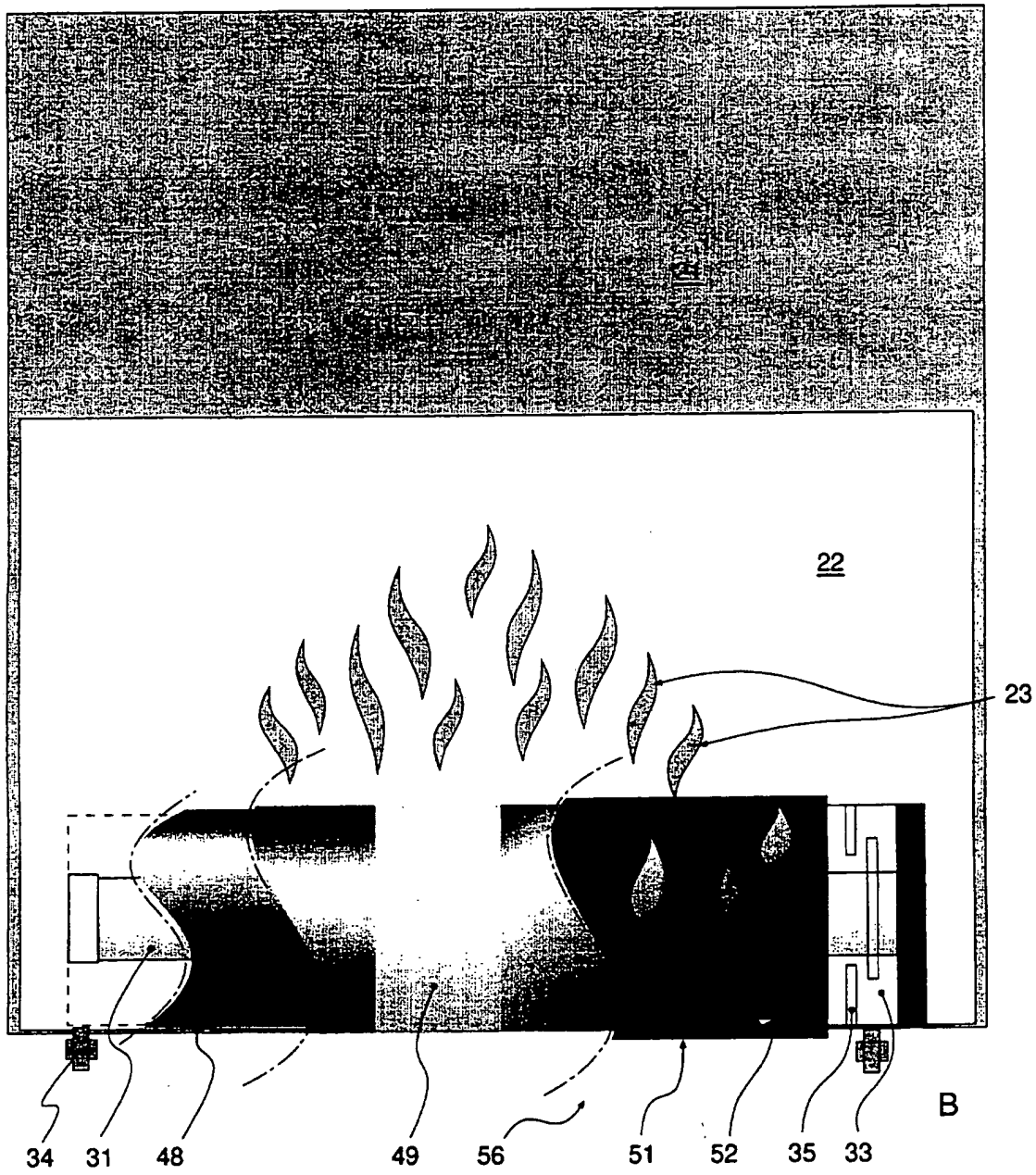
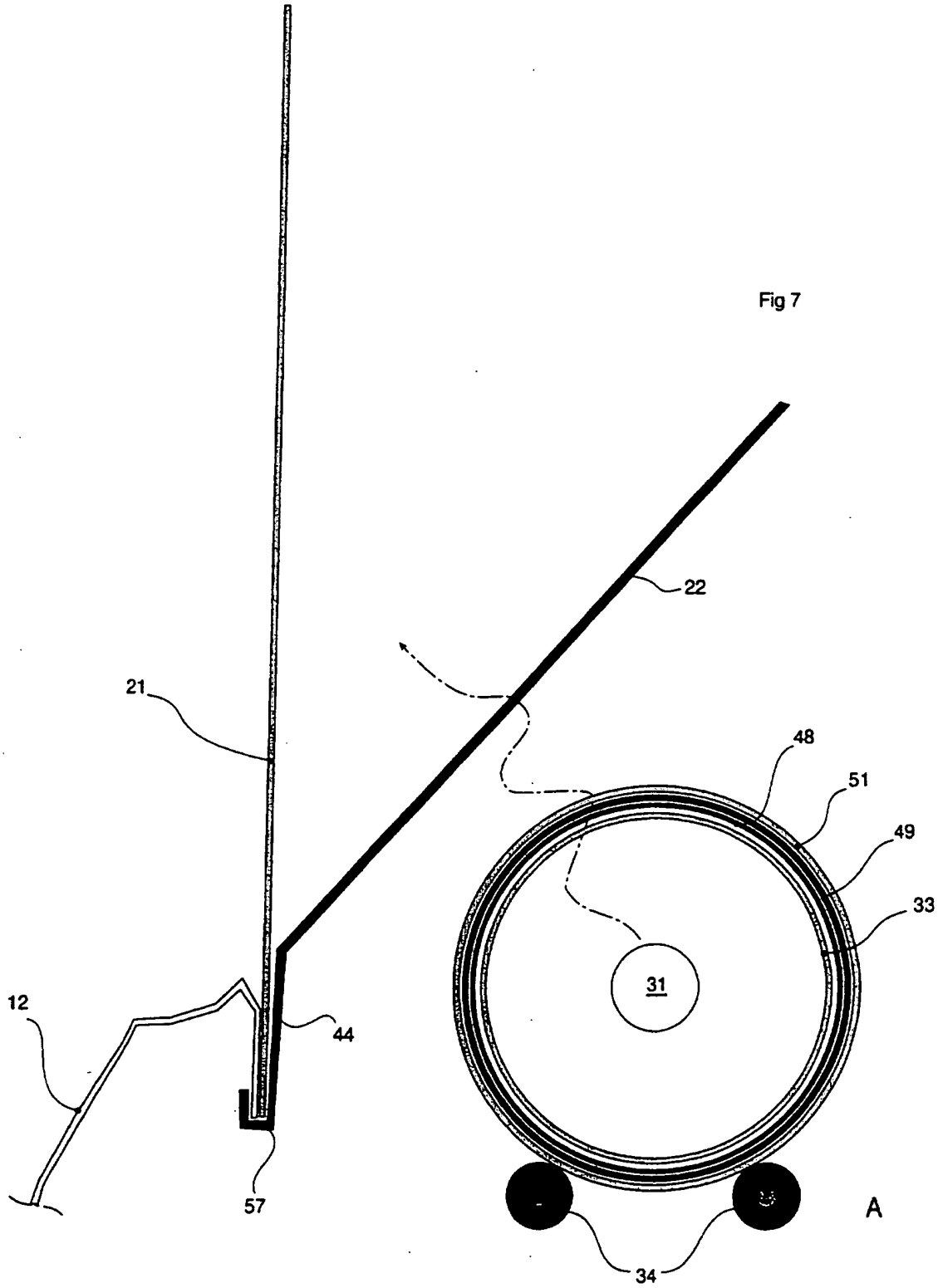


Fig 6

Fig 7



Flame Effect Fire

This invention relates to flame effect fires and is particularly, but not exclusively, concerned with (dynamic) simulation, evocative of fuel burning activity, such as characteristic combustion gas flames emitted by a solid fuel (eg coal or wood) fire.

Realism aside, a flame effect should be visually appealing and empathetic - to engender an aura of warmth, relaxation and comfort. These factors can convince the viewer of the flame effect realism - albeit apparent rather than substantive.

The term 'flame effect' is used herein to refer to the simulation of combustion and burning combustion gases, such as transient flickering and incandescence or glow attendant exothermic fuel combustion.

A 'flame effect fire' might include, as a heating element, a radiant bar or convector, electric, gas or other heating element - or indeed it may provide no heat whatsoever.

In the present invention, it is the flame effect of the fire which is of primary concern, rather than the nature of the heat or its source. That said, the invention is especially suited to electric fires.

The flame effect generator should desirably be capable of working in a heat-generating environment - although this is less critical for light-only variants of the invention also envisaged.

Even without a means for emitting heat implemented, or activated, a flame effect fire can provide an aesthetically pleasing visual simulation of a fire and the accompanying feeling, by auto-suggestion, if not physical sensation, of warmth. Thus the effect can be valuable as a psychological comfort trigger.

Numerous proposals have been made for achieving a convincing, realistic or satisfactory flame effect, with varying success. Tungsten filament lamps, electronic controlled neons and elaborate multi-screen optical effects have all been employed. However, generally, it has proved difficult to achieve a low cost, realistic ('dynamic') flame effect.

According to one aspect of the invention,
a flame effect generator comprises
a light source,
situated inside a (part) translucent rotary drum,
a circumferential filter sleeve around the drum,
a mask perforated with an array of apertures,
and a forward viewing diffuser screen,
positioned for back-projection
of light emerging from the light source,
through the drum, sleeve and mask.

Conveniently, the light source is an elongate tungsten filament or fluorescent strip-light, positioned (axially) within the rotary drum.

Desirably, the drum is of translucent, heat-resistant, synthetic plastics material, such as polycarbonate - which will suffer minimal adverse effects from high ambient temperatures.

Such plastics material is also relatively light-weight, for ease of support and rotation.

The drum may be rotated by an electric (stepper) motor drive, with an output shaft connected through a reduction gearbox to one end of the drum.

In a preferred embodiment, the drum rests upon a set of circumferentially-spaced rollers, which allow it to rotate while maintaining its (horizontal) orientation.

This arrangement avoids loading the motor spindle, with drum length and allows tolerant self-alignment of the drum and drive.

Certain regions of the drum could be opaque, and punctuated by other translucent regions, either clear or tinted, to allow a variable controlled egress of light from the inner light source, as the drum rotates.

It should be noted that rotary drums, with rear reflectors, are known per se for flame effect fires, for example as taught in UK patent no. 414,280, but have not been integrated with other optical projection elements, as with the present invention.

The inner light source could also be modulated or pulsed to achieve a variable output intensity.

The sleeve could be of varying opacity and incorporate colour filters.

Conveniently, the sleeve is a cylindrical wrap from a printed sheet of heat resistant acetate, such as used with overhead projectors, or as photocopying or printer film.

The sheet may thus be printed with a black on clear and/or coloured pattern of flame effects in appropriate hues, such as red, orange, blue.

The pattern (density), along with the drum rotational speed, determine the colour change frequency of the resultant flame effect.

The printed sleeve sheet, and/or indeed the drum itself, may be given a glazed or a 'marbled' surface effect, to achieve a more fuzzy, blurred or hazy image - and as such one emulating a 'smoky' flame.

The apertures in the drum may be flame shaped, but other shape apertures could create a satisfactory effect.

Similarly, flame-shaped apertures could also feature in the intermediate mask screen,

and possibly fitted with colour filter material.

Any or all of the mask, drum and sleeve, can be replaceable, for a change in optical effect. Thus flame projector decorative changes and upgrades can be envisaged - even, say, seasonally.

Shields are desirably fitted around the drum to prevent interference to the flame effect from stray light, for example from illumination of a fuel moulding.

However, selective controlled interference between such diverse light sources may be deployed toward creating a coherent flame effect.

The forward diffuser screen is essentially upright, and is positioned generally behind the fuel effect moulding - so that light projections, simulating flames, appear to rise from the fuel (moulding) itself.

For the desired visual effect, the diffuser screen should spread and soften the emergent light pattern.

Suitable materials for the diffuser screen include a translucent, optionally colour-tinted, sheet of synthetic plastics material, such as perspex or acrylic, with a matt surface on one side, preferably faced to the rear.

The fire could also include a static fuel effect moulding, profiled to model a bed of coals or logs, and illuminated from below by a continuous light source, periodically interrupted by a flicker effect generator, such as a rotating spinner vane, driven by convective rising of hot air from the lamp.

Adjacent, for example beneath, the fuel and flame effect parts of the fire, there could be fitted a heat source, such as radiant elements or a convector fan.

There now follows a description of a particular embodiment of the invention, by way of example only, with reference to the accompanying diagrammatic and schematic drawings, in which:

Figure 1 shows a general front perspective view from one side of a flame effect fire;

Figure 2 shows a part cut-away front perspective view of the fire of Figure 1, from the other side;

Figure 3 shows a part-disassembled view of the fire of Figures 1 and 2, with a fuel effect shroud, front diffuser screen and an intermediate mask removed;

Figure 4 shows a cross-sectional side elevation, taken along the line A-A in Figure 1;

Figure 5 shows, an enlarged, exploded, fragmented and part cut-away view of the flame projector module of the fire of Figure 1;

Figure 6 shows an internal, part cut-away front elevation of the projector module of Figure 5; and

Figure 7 shows a side elevation of principal elements of a projector module of Figures 5 and 6.

Referring to the drawings, a flame effect fire 10 incorporates flame effect generator 46, illuminated fuel 'bed' effect 12 and heater module 47, within a common housing 11.

The housing 11 is of pressed and folded metal sheet construction, styled to evoke a conventional solid fuel fire, by replicating the characteristic principal elements of fire surround, grate, and fire brick enclosure around a solid fuel bed.

The fuel bed 12 is modelled by a moulded - typically from glass (fibre) reinforced plastics (GRP) - translucent sheet layer, shaped, coloured and finished to replicate a cluster of glowing coals or logs. A coal effect 12 is depicted in this example.

In the lower part of the housing 11 is a (convector) heater module 47, which outputs through a vent 13 in the lower front wall of the housing 11.

Radiant heater elements may substitute for the convector heater.

An array of switches 14 on the side of the housing 11 (individually) control the heater, fuel and flame effects.

The (colour-tinted) fuel (eg coal) effect 12 is illuminated from below to achieve a coloured glow or aura, with a superimposed intermittent flicker imitating an active fire.

Such fuel effect illumination is by a pair of tungsten filament, clear-glass (or optionally colour-tinted), lamps (eg tungsten filament bulbs) 41, surmounted by stands 43, supporting rotary spinner vanes 42.

The spinner vanes 42 are profiled to rotate upon impact by heated air convection currents from the underlying lamps 41, when illuminated.

Light from the bulbs 41 is periodically interrupted by the spinner vanes 42 and is projected onto the inside of the fuel effect casing 12, producing a flickering coloured (say orange-red) glow.

A diffuser screen 21 of heat-resistant, translucent synthetic plastics sheet material, such as polycarbonate, is positioned above the fuel effect 12.

One (in this case) rear face of the screen 21 is smooth, whilst the other (front) face is matt-finished, to inhibit stray reflection and diffuse light projected thereupon.

In some variants, the diffuser screen and fuel effect layer could be joined, or even integrated in a single sheet.

Figure 2 shows an intermediate mask 22 of metal sheet, painted black to avoid unwanted light reflection.

Flame-shaped apertures 23 in the mask 22 allow controlled projection of light to diffuser screen 21.

Figure 3 shows the flame effect assembly 46 with the mask 22 and diffuser screen 21 removed.

An elongate (filament) lamp 31 is positioned axially within a rotary, translucent (or part-translucent) drum 33 of heat-resistant, synthetic plastics material, such as polycarbonate.

The drum 33 is driven by an electric motor 32 through a reduction gearbox end connection.

The drum 33 sits upon a circumferentially-spaced pair of support and guidance rollers 34, allowing drum rotation, while supporting its weight - and without loading the motor output shaft.

Such rollers 34 may be located at one end of the drum 33, for example that remote from the drive motor 32, or at both ends, with, say one set being used as a friction drive to the drum circumference.

This 'tolerant', self-aligning (roller) mounting effectively acts as a 'flexible' drive coupling, which also obviates drive motor shaft and drum axle alignment problems.

The drum 33 has a series of slots 35, at least at one end, to allow egress of heat from the internal lamp 31, and thereby to avoid excessive temperature build-up.

Drum slots may also feature as a localised optical mask.

The drum 33 is surrounded by a sheet sleeve 36 of partially translucent thermoplastic, but (mildly) heat tolerant, sheet material, such as special electrostatic copier or laser printer acetate film, printed with flame imagery.

The sheet 36 may embody a mottled or marbled pattern, as a background effect, to evoke a hazy or smoky image.

The sheet 36 also embodies sporadic array of flame-shaped translucent, or cut-out (aperture), portions 37 - which may also be coloured (or filled with colour film) to act as filters, producing mild flashes of coloured light upon drum rotation.

Figure 4 shows the heater module 47 isolated from the flame effect generator 46 in the lower part of the housing 11.

A shield 44 isolates illumination of the fuel effect 12 from the flame effect generator 46.

Figure 7 shows a variant of the shield 44 re-orientated and re-profiled, with a lower turned lip or ledge 57, to locate an intermediate diffuser screen 21, along with an (in-turned) upper rear edge of the fuel effect (layer) 12.

This could help provide a snug inter-fit of diffuser screen 21 and fuel effect 12, inhibiting unwanted light spillage from the underside lamps 41.

Indeed, the fuel effect layer 12 could be contiguous with the diffuser screen 21, for example in a single integrated moulding, or two sheets edge-bonded.

Figure 5 shows the flame effect generator 46 in more detail, with a more elaborate variant of the sleeve 36, in the form of a sleeve assembly 56, using a co-operative multiple filter array of stacked and inter-nested layers 48, 49 and 51.

Thus, an inner layer 48 is a single translucent colour filter.

An intermediate layer 49 is a multiple colour filter.

An outer masking layer 51 embodies a pattern of flame-shaped apertures 52.

Collectively and cumulatively, the multiple individual filter and masking layers 48, 49 and 51 comprise a sleeve assembly 56 contributing a changing pattern of inter-weaving shaped and coloured flame images 61, projected through the mask apertures 23 on to the diffuser screen 21, as the drum 33 rotates.

The constituent parts of the sleeve assembly 56, along with the mask 22, and indeed even the drum 33, may be varied to achieve different flame effects, without having to change other principal components.

With suitable distancing from the lamp 31, filter or mask sleeves could be located internally of the drum 33, and, for example, held in situ simply by their resilience when coiled.

Alternatively, sleeves could be held captive between inter-fitting drums.

The projector lends itself to upgrading of existing installed fires and tailoring of projection effects to local installations for complementary decorative effect.

Thus the projector can become a 'magic lantern', as a dominant focal point for a room - much as a real fire can become.

Multiple drums could be employed, possibly with different rotational speeds, rotational directions and rotational axes, for a more elaborate cumulative lighting effect - even with drums fitted one inside another - with co-operative colour-tinting, patterning, masking apertures, etc.

The or each drum could have a stepped profile, to accommodate filter and/or mask sleeves of different diameters, again for variety of light projection effect.

Similarly, multiple individual projector modules could be fitted to a single fire housing or multiple individual fires could be operated in unison with complementary projector effects.

A stepper motor drive could be used for the or each drum, for more precise and synchronized control rotation and relative angular position, from drive pulses generated by a programmable timing pulse generator.

In some variants the lighting effect is paramount, over any heat output, and indeed a light projector could be envisaged without any heater facility.

Thus, for example, an illuminated fire screen, integrating a projector module such as described, with a stand-alone projection screen, combining external and internal reflection, could be achieved.

The lighting effects could be variable, to suit, say, user mood, time of day and local decorative ambience.

Component List

10	flame effect fire
11	housing
12	fuel (eg coal) effect
13	vent
14	switches
21	diffuser screen
22	(intermediate) mask
23	flame-shaped apertures
31	(elongate filament) lamp
32	motor/gearbox
33	drum
34	mounting rollers
35	slots
36	sleeve
37	translucent/cut-out portions
41	lamp
42	spinner vane
43	stand
44	shield
46	flame effect generator
47	heater module
48	inner filter layer
49	intermediate filter layer
51	outer mask layer
52	(flame shaped) apertures
56	sleeve assembly
57	lip
61	coloured 'flame' image

Claims

1.

A flame effect generator (46)
for a fuel effect fire (10),
comprising a (part) translucent rotary drum (33),
a circumferential sleeve (36),
for fitment around the drum,
and embodying a plurality of translucent images,
a light source (31),
located within the drum,
an intermediate mask (22)
to selectively screen light,
projected through the mask,
to a translucent front diffuser screen (21).

2.

A flame effect generator, substantially as hereinbefore described, with reference to, and as shown in, the accompanying drawings.

3.

A fire incorporating a flame effect generator as claimed in any of the preceding claims.

4.

A lighting effect generator,
comprising a projector module,
with a projection light source,
located with a rotary drum,
superimposed with co-operative sleeves or collars,
embodying discrete selective
masking and colour filters,
to achieve a desired cumulative filter effect,
for projection, as a moving image,
upon a remote viewing surface or screen.

The Patent Office

9

Application No: GB 9702246.1 **Examiner:** M C Monk
Claims searched: 1-3 **Date of search:** 20 April 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): F4W

Int Cl (Ed.6): F24C (7/00)

Other: ONLINE DATABASE:WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB 2267563 A	ELECTRICITY ASSOCIATION TECHNOLOGY LTD Irregular reflective surface (14) on roller (10).	1
A	GB 1097812	BELLING & CO Drum (6) comprises a skin of crinkled polished aluminium foil on a wire cage (8).	1
A	GB 450941	GENERAL ELECTRIC CO Consider whole document; see especially ll.101-107 p.2	1
X	GB 414280	SIMPLEX ELECTRIC LTD Consider whole document; see especially ll.51-58 p.2, light source (E), screen (f), & screen (G).	1-3

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.